



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,382	08/27/2003	Nebojsa Jojic	301911.01	6064

27662 7590 10/04/2007  
MICROSOFT CORPORATION  
C/O LYON & HARR, LLP  
300 ESPLANADE DRIVE  
SUITE 800  
OXNARD, CA 93036

EXAMINER

RASHID, DAVID

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
10/04/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/649,382

**Applicant(s)**

JOJIC ET AL.

**Examiner**

David P. Rashid

**Art Unit**

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 33-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/23/2004</u> . | 6) <input type="checkbox"/> Other: ____  |

### **DETAILED ACTION**

All of the examiner's suggestions presented herein below have been assumed for examination purposes, unless otherwise noted.

#### ***Election/Restriction***

1. Election was made **without** traverse of **Invention I** (i.e. **claims 1 – 32**) by applicant in the reply filed on 9/10/2007 is acknowledged.
2. **Claims 33 – 38** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected **Invention II**, there being no allowable generic or linking claim.

#### ***Specification***

3. The following is a quote from 37 CFR 1.72:  
  
(b) A brief abstract of the technical disclosure in the specification must commence on a separate sheet, preferably following the claims, under the heading "Abstract " or "Abstract of the Disclosure." The sheet or sheets presenting the abstract may not include other parts of the application or other material. The abstract in an application filed under 35 U.S.C. 111 may not exceed 150 words in length. The purpose of the abstract is to enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure.
4. The abstract is objected to because (i) the title of the invention is contained on the abstract sheet and (ii) the abstract exceeds 150 words in length – suggest removing the title of the invention from the abstract sheet, and containing word in length to between 50 and 150 words.

#### ***Claim Rejections - 35 USC § 101***

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

6. **Claims 1 – 22 and 23 – 32** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. **Claims 1 – 22** define "[a] system" and **claims 23 – 32** define "[a] computer-implemented process...comprising using a computer to..." embodying functional descriptive material. However, the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases" since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). That is, the scope of the presently claimed "system" and "computer-implemented process...comprising using a computer to..." can range from paper on which the program is

Art Unit: 2624

written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claim to embody the program on “computer-readable medium” or equivalent in order to make the claim statutory. Any amendment to the claim should be commensurate with its corresponding disclosure.

7. The applicant must also note normally a claim would be statutory when residing on a “computer-readable medium” or its definite equivalent (e.g. “computer-readable media”). However, the specification, at pages 11 - 12 defines the claimed computer readable medium as encompassing statutory media such as a “ROM”, “hard drive”, “optical drive”, etc, as well as *non-statutory* subject matter such as a “carrier wave”, “modulated data signal”, and other equivalents thereof.

A “signal” embodying functional descriptive material is neither a process nor a product (i.e., a tangible “thing”) and therefore does not fall within one of the four statutory classes of § 101. Rather, “signal” is a form of energy, in the absence of any physical structure or tangible material.

Because the full scope of the claim as properly read in light of the disclosure encompasses non-statutory subject matter, the claim as a whole is non-statutory. The examiner suggests amending the claim to *include* the disclosed tangible computer readable media, while at the same time *excluding* the intangible media such as signals, carrier waves, etc. Any amendment to the claim should be commensurate with its corresponding disclosure.

Art Unit: 2624

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. **Claims 1 – 3, 5 – 6, 14, 18 – 19, and 23 – 24** are rejected under 35 U.S.C. 102(b) as being anticipated by Foote et al. (US 6,404,925 B1).

Regarding **claim 1**, Foote discloses a system (FIG. 1; FIG. 2) for automatically decomposing an image sequence (FIG. 2, element 201), comprising:

providing an image sequence (FIG. 2, element 201) of at least one image frame (FIG. 3, elements 301 – 308) of a scene;

providing a preferred number of classes of objects (“pre-defined set of classes” in Col. 5, lines 14 – 16) to be identified within the image sequence;

automatically decomposing the image sequence into the preferred number of classes of objects in near real-time (“segmenting...into a pre-defined set of classes” in Col. 5, lines 14 – 16)

Regarding **claim 2**, Foote discloses the system of claim 1 wherein providing the preferred number of objects (“pre-defined set of classes” in Col. 5, lines 14 – 16) comprises specifying the preferred number of classes of objects via a user interface (a user interface is visual interface

Art Unit: 2624

from which a user can interact with such as FIG. 22; a pre-defined set of classes suggests that some sort of user interface must have been used to “define” the set of classes; “[t]he feature used for classification are general, so that users can define arbitrary class types” in Col. 5, lines 18 – 20).

Regarding **claim 3**, Foote discloses the system of claim 1 wherein decomposing the image sequence (FIG. 2, element 201) into the preferred number of objects (“segmenting...into a pre-defined set of classes” in Col. 5, lines 14 – 16) comprises automatically learning a 2-dimensional model (FIG. 3, elements 310 – 322) of each object class (Col. 7, lines 13 – 15).

Regarding **claim 5**, Foote discloses the system of claim 1 wherein automatically decomposing the image sequence (FIG. 2, element 201) into the preferred number of object classes (“pre-defined set of classes” in Col. 5, lines 14 – 16) comprises performing an inferential probabilistic analysis (FIG. 2, elements 202 – 205; “Gaussian distributions” in Col. 5, line 65 – Col. 6, line 2) of each image frame for identifying (“segmenting...into a pre-defined set of classes” in Col. 5, lines 14 – 16) the preferred number of object class appearances within the image sequence.

Regarding **claim 6**, Foote discloses the system of claim 5 wherein performing an inferential probabilistic analysis of each image frame comprises performing a variational generalized expectation-maximization analysis (Col. 21, lines 55 – 62) of each image frame (FIG. 3, elements 301 – 308) of the image sequence (FIG. 2, element 201), wherein the expectation-maximization analysis employs a Viterbi algorithm (Col. 6, lines 43 – 45; Col. 16, lines 40 – 42) in a process of filling in values of hidden variables (Col. 21, lines 55 – 62; variables in FIG. 4) in a model describing the object class.

Art Unit: 2624

Regarding **claim 14**, Foote discloses the system of claim 1 wherein automatically decomposing the image sequence into the preferred number of object classes comprises performing a probabilistic variational expectation-maximization analysis (Col. 21, lines 55 – 62).

Regarding **claim 18**, Foote discloses the system of claim 1 further comprising a generative model (“hidden Markov model” in Col. 18, lines 35 – 42) which includes a set of model parameters (“alignment” in Col. 18, lines 35 – 42) that represent the entire image sequence (“entire video” in Col. 18, line 37).

Regarding **claim 19**, Foote discloses the system of claim 1 further comprising a generative model which includes a set of model parameters that represent the images of the image sequence processed to that point (Col. 21, lines 4 – 15).

Regarding **claim 22**, Foote discloses the system of claim 19 further comprising automatically reconstructing a representation of the image sequence from the generative model, wherein the representation comprises the preferred number of object classes (FIG. 2, element 207).

Regarding **claim 23**, Foote discloses a computer-implemented process for automatically generating a representation of an object in at least one image sequence (FIG. 1; FIG. 2), comprising using a computer to:

acquire at least one image sequence (FIG. 2, element 201), each image sequence having at least one image frame (FIG. 3, elements 301 – 308);

automatically decompose each image sequence into a generative model (FIG. 2, elements 202 – 205; “Gaussian distributions” in Col. 5, line 65 – Col. 6, line 2), with each generative model including a set of model parameters (FIG. 4; Col. 7, lines 59 – 60) that represent at least



Art Unit: 2624

one object class for each image sequence using an expectation-maximization analysis (Col. 21, lines 55 – 62) that employs a Viterbi analysis (Col. 6, lines 43 – 45; Col. 16, lines 40 – 42).

Regarding **claim 24**, claim 2 recites identical features as in claim 24. Thus, references/arguments equivalent to those presented above for claim 2 are equally applicable to claim 24.

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. **Claims 4, 7, and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Foote et al. (US 6,404,925 B1) in view of Petrovic et. al (Transformed Hidden Markov Models: Estimating Mixture Models of Images and Inferring Spatial Transformations in Video Sequences, Computer Visions and Pattern Recognition, 2000, Vol. 2, pg 26 - 33).

Regarding **claim 4**, while Foote discloses the system of claim 3, Foote does not directly suggest wherein the model employs a latent image and a translation variable in learning each object class.

Petrovic discloses transformed hidden markov model wherein the model employs a latent image (“latent image”, pg 27 – 28) and a translation variable (“set of transformations...”, pg 27, right column) in learning each object class.

Art Unit: 2624

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the model of Foote to employ a latent image and a translation variable in learning each object class as taught by Petrovic to “develop a general video analysis tool that extracts long and short term similarities in video using a novel generative model, called the transformed hidden Markov model (THMM).”, Petrovic, pg 26 and to “learn models of different types of object from unlabeled frames in a video sequence that include background clutter, occlusion and spatial transformations, such as translation, rotation and shearing.”, Petrovic, pg. 26.

Regarding **claim 5**, while Foote discloses the system of claim 3, Foote does not directly suggest wherein the model describing the object class employs a latent image and a translation variable in filling in said hidden variables.

Petrovic discloses transformed hidden markov model wherein the model describing the object class employs a latent image (“latent image”, pg 27 – 28) and a translation variable (“set of transformations...”, pg 27, right column) in filling in hidden variables (pg 29).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the model of Foote to employ a latent image and a translation variable in filling in hidden variables as taught by Petrovic to “develop a general video analysis tool that extracts long and short term similarities in video using a novel generative model, called the transformed hidden Markov model (THMM).”, Petrovic, pg 26 and to “learn models of different types of object from unlabeled frames in a video sequence that include background clutter, occlusion and spatial transformations, such as translation, rotation and shearing.”, Petrovic, pg. 26.

Art Unit: 2624

Regarding **claim 27**, claim 4 recites identical features as in claim 27. Thus, references/arguments equivalent to those presented above for claim 4 are equally applicable to claim 27.

12. **Claims 8 – 10, 13, 15 – 17, and 28 – 31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Foote et al. (US 6,404,925 B1) in view of Dellaert (The Expectation Maximization Algorithm, College of Computing, Georgia Institute of Technology, Technical Report number GIT-GVU-02-20, 2/2002).

Regarding **claim 8**, while Foote discloses a generalized expectation-maximization analysis, Foote does not directly teach wherein an expectation step of the generalized expectation-maximization analysis maximizes a lower bound on a log-likelihood of each image frame by inferring approximations of variational parameters.

Dellaert discloses the expectation maximization algorithm that teaches wherein an expectation step of the generalized expectation-maximization analysis maximizes a lower bound on a log-likelihood by inferring approximations of variational parameters (Section 2, “EM as Lower Bound Maximization”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the generalized expectation-maximization for each image frame of Foote to include wherein an expectation step of the generalized expectation-maximization analysis maximizes a lower bound on a log-likelihood by inferring approximations of variational parameters as taught by Dellaert as “[t]he goal is to maximize the posterior probability (1) of the

Art Unit: 2624

parameters  $\Theta$  given the data  $U$ , in the presence of hidden data  $J$ .”, Dellaert, Section 2, “EM as Lower Bound Maximization”.

Regarding **claim 9**, while Foote discloses a generalized expectation-maximization analysis, Foote does not directly teach wherein the maximization step of the generalized expectation-maximization analysis automatically adjusts model parameters in order to maximize a lower bound on a log-likelihood of each image frame.

Dellaert discloses the expectation maximization algorithm that teaches wherein the maximization step of the generalized expectation-maximization analysis automatically adjusts model parameters in order to maximize a lower bound on a log-likelihood (converting  $\Theta$  into  $\Theta^{t+1}$  in equation (4) in Section 2.2, “Maximizing the Bound”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the generalized expectation-maximization for each image frame of Foote to include wherein the maximization step of the generalized expectation-maximization analysis automatically adjusts model parameters in order to maximize a lower bound on a log-likelihood as taught by Dellaert as “[t]he goal is to maximize the posterior probability (1) of the parameters  $\Theta$  given the data  $U$ , in the presence of hidden data  $J$ .”, Dellaert, Section 2, “EM as Lower Bound Maximization”.

Regarding **claim 10**, while Foote discloses a generalized expectation-maximization analysis, Foote does not teach wherein the expectation step and the maximization step are performed once for each image in said image sequence.

Art Unit: 2624

Dellaert discloses the expectation maximization algorithm that teaches wherein the expectation step and the maximization step are performed once for each set of new data (equation (4) pg 6 to obtain  $\Theta^{t+1}$  is only computed once for each set of new data).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for each image frame of the image sequence of Foote to be the new data as taught by Dellaert as “[t]he goal is to maximize the posterior probability (1) of the parameters  $\Theta$  given the data  $U$ , in the presence of hidden data  $J$ .”, Dellaert, Section 2, “EM as Lower Bound Maximization”.

Regarding **claim 13**, Foote discloses wherein automatic computation of the expectation step is accelerated by using a Viterbi analysis (Col. 6, lines 43 – 45; Col. 16, lines 40 – 42; Col. 18, lines 31 – 48).

Regarding **claim 15**, while Foote discloses a generalized expectation-maximization analysis, Foote does not directly teach wherein the expectation-maximization analysis comprises: forming a probabilistic model having variational parameters representing posterior distributions; initializing said probabilistic model; inputting an image frame from the image sequence; computing a posterior given observed data in said image sequence; and using the posterior of the observed data to update the probabilistic model parameters.

Dellaert discloses the expectation maximization algorithm that teaches wherein the expectation-maximization analysis comprises:

forming a probabilistic model having variational parameters (“ $\Theta^b$ ”, “ $\Theta^{t+1}$ ”, means “ $\theta_1$ ” and “ $\theta_2$ ”) representing posterior distributions (last paragraph, pg 1);

Art Unit: 2624

initializing said probabilistic model (the probabilistic model has to be initialized at some point to obtain  $\Theta^{t+1}$ );

inputting new data ("current guess"  $\Theta^t$  from equation (3), pg 5 to "improved estimate"  $\Theta^{t+1}$ );

computing a posterior given observed data ("log-posterior  $\log P(\Theta|U)$ ", pg 6); and

using the posterior of the observed data to update the probabilistic model parameters ("M-step" equation, pg 6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the new image frame from the image sequence of Foote to be the new data as taught by Dellaert and that the generalized expectation-maximization analysis of Foote to include wherein the expectation-maximization analysis comprises: forming a probabilistic model having variational parameters representing posterior distributions; initializing said probabilistic model; inputting; computing a posterior given observed data; and using the posterior of the observed data to update the probabilistic model parameters as taught by Dellaert as "[t]he goal is to maximize the posterior probability (1) of the parameters  $\Theta$  given the data  $U$ , in the presence of hidden data  $J$ .", Dellaert, Section 2, "EM as Lower Bound Maximization".

Regarding **claim 16**, Foote discloses wherein the expectation-maximization analysis further comprises:

outputting the model parameters (Col. 21, lines 55 – 62).

Regarding **claim 17**, Foote discloses further comprising incrementing to the next image frame in said image sequence and repeating the actions after initializing the probability model

Art Unit: 2624

until the end of the image sequence has been reached (the loops in FIG. 12, FIG. 20, FIG. 26, and FIG. 28 until frame sequence are complete).

Regarding **claim 28**, claim 8 recites identical features as in claim 28. Thus, references/arguments equivalent to those presented above for claim 8 are equally applicable to claim 28.

Regarding **claim 29**, claim 9 recites identical features as in claim 29. Thus, references/arguments equivalent to those presented above for claim 9 are equally applicable to claim 29.

Regarding **claim 30**, claim 15 recites identical features as in claim 30. Thus, references/arguments equivalent to those presented above for claim 15 are equally applicable to claim 30.

Regarding **claim 31**, claim 16 recites identical features as in claim 31. Thus, references/arguments equivalent to those presented above for claim 16 are equally applicable to claim 31.

13. **Claims 11 – 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Foote et al. (US 6,404,925 B1) in view of Dellaert (The Expectation Maximization Algorithm, College of Computing, Georgia Institute of Technology, Technical Report number GIT-GVU-02-20, 2/2002) and Eberman et al. (US 5,925,065 A).

Regarding **claims 11 and 12**, while Foote in view of Dellaert disclose a computer-readable process of claim 8 wherein computation of the expectation step is suggested to use

Art Unit: 2624

some form of transform, Foote in view of Dellaert does not teach accelerating the expectation step using a FFT-based inference analysis.

Eberman teaches using a FFT-based inference analysis (Col. 5, lines 19 – 27).

It would have been obvious for the computation of the expectation step of Foote in view of Dellaert to include using a FFT-based inference analysis as taught by Eberman to reduce calculation time ( $2N^2$ ) as less computation is needed ( $2N \log_2 N$ ) as well known to one of ordinary skill in the art.

It is well known to one of ordinary skill in the art that using the FFT requires performance on variables ( $x_n, k, N$ ) that are converted into a coordinate system ( $X_k$  coordinate system) wherein transforms applied to those variables are represented by shift operations ( $x_n$  shifted by exponential on right side of equation to equal  $X_k$ ).

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi j}{N} nk} \quad k = 0, \dots, N-1.$$

14. **Claims 20 – 21 and 25 – 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Foote et al. (US 6,404,925 B1) in view of Jojic et al. (Learning Flexible Sprites in Video Layers, Proc. of IEEE Conf. on Computer Vision and Pattern Recognition, 2001, pg 1 – 8)

Regarding **claim 20**, while Foote discloses the system of 19, Foote does not teach wherein the model parameters include: a prior probability of at least one object class; and means and variances of object appearance maps.

Jojic discloses a learning flexible sprites in video layers wherein the model parameters include:



Art Unit: 2624

a prior probability of at least one object class (“prior probability  $p(c)$  of spring class  $c$ ”, pg 3); and

means and variances of object appearance maps (“means and variances of the sprite appearance maps”, pg 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for system of Foote to include wherein the model parameters include: a prior probability of at least one object class; and means and variances of object appearance maps as taught by Jojic to “focus on learning the appearances of multiple objects in multiple layers, over the entire video sequence.”, Jojic, pg 1 and to provide “probabilistic 2- dimensional appearance maps and masks of moving, occluding objects.”, Jojic, pg 1.

Regarding **claim 21**, while Foote in view of Jojic discloses the system of 20, Foote in view of Jojic do not teach wherein the model further comprises observation noise variances.

Jojic discloses a learning flexible sprites in video layers wherein the model parameters include observation noise variances “the observation noise variances  $\beta$ ”, pg 3.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for system of Foote to include wherein the model further comprises observation noise variances as taught by Jojic to “focus on learning the appearances of multiple objects in multiple layers, over the entire video sequence.”, Jojic, pg 1 and to provide “probabilistic 2- dimensional appearance maps and masks of moving, occluding objects.”, Jojic, pg 1.

Regarding **claims 25 and 26**, while Foote discloses the computer-implemented process of claim 23, Foote does not teach wherein the model parameters of each generative model includes

(i) an object class appearance map,

Art Unit: 2624

(ii) a prior probability of at least one object class, and

(iii) means and variances of that object class appearance map.

Jojic discloses a learning flexible sprites in video layers wherein the model parameters includes (i) an object class appearance map, (ii) a prior probability of at least one object class, and (iii) means and variances of that object class appearance map (Section 5, "Interference and Learning", first paragraph, pg 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for each generative model of Foote to include (i) an object class appearance map, (ii) a prior probability of at least one object class, and (iii) means and variances of that object class appearance map as taught by Jojic to "focus on learning the appearances of multiple objects in multiple layers, over the entire video sequence.", Jojic, pg 1 and to provide "probabilistic 2-dimensional appearance maps and masks of moving, occluding objects.", Jojic, pg 1.

15. **Claim 32** is rejected under 35 U.S.C. 103(a) as being unpatentable over Foote et al. (US 6,404,925 B1) in view of Eberman et al. (US 5,925,065 A).

Regarding **claim 32**, claim 11 recites identical features as in claim 32. Thus, references/arguments equivalent to those presented above for claim 11 are equally applicable to claim 32.

Art Unit: 2624

***Conclusion***

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David P. Rashid whose telephone number is (571) 270-1578. The examiner can normally be reached Monday - Friday 8:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/  
Examiner, Art Unit 2624

David P Rashid  
Examiner  
Art Unit 2624



**BRIAN WERNER**  
**SUPERVISORY PATENT EXAMINER**